UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/676,425	09/29/2000	Tova Roth	YOR920000465US1	5711

33233 7590 03/15/2004

LAW OFFICE OF CHARLES W. PETERSON, JR.
P.O. BOX 710627
OAK HILL, VA 20171

EXAMINER	
ALI, SYED J	

ART UNIT	PAPER NUMBER
2127	7

DATE MAILED: 03/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/676,425	ROTH ET AL.	
	Examiner	Art Unit	
	Syed J Ali	2127	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 September 2000*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *4*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-18 are pending in this application.

Claim Objections

2. Claims 5, 7, 10, and 12 are objected to because of the following informalities:

There is no period at the end of either of claims 5 or 12.

In claim 7, "A task management method as in claim 3 wherein" should read "A task management method as in claim 3, wherein".

In claim 10, "A distributed process system as in claim 9 wherein" should read "A distributed process system as in claim 9, wherein".

Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 7 and 18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 recites the limitation "in placement step (e)" in line 3. There is insufficient antecedent basis for this limitation in the claim. For purposes of treating this claim on the merits,

it will be assumed hereinafter that the above limitation was intended to read "in placement step (f)".

In claim 18, the limitation of "said function is an integrated circuit" is unclear. Specifically, "an integrated circuit" is a hardware element whereas the claimed "function" is a software element. For purposes of treating this claim on the merits, it will be assumed hereinafter that the above limitation was intended to read "said function is integrated circuit chip functional element placement", which is similar to limitations presented in claim 7.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hunt (USPN 6,629,123) in view of Ibe et al. (USPN 6,437,04) (hereinafter Ibe).

As per claim 1, Hunt teaches the invention as claimed, including a task management method for determining optimal placement of task components, said method comprising:

a) generating a communication graph representative of a task (col. 23 lines 13-23, "the application units and inter-unit communication form a commodity flow network",

wherein the application units are components of a task or an application program, and the inter-unit communication provides information pertaining to the weighting of edges), task components represented as nodes of said communication graph (col. 24 lines 8-28, "Create one node for each unit in the applications") and edges connecting ones of said nodes, said edges representing communication between connected nodes and being weighted proportional to communication between connected nodes (col. 24 lines 8-28, "Create one edge between every pair of communication units. The weight on the edge should be the difference between communication cost [communication time] for the remote case [when two application units are placed on separate machines] and the local case [when the two application units are placed on the same machine]");

e) determining a min cut solution for said communication graph (col. 24 lines 8-28, "the algorithm to map a client-server distributed partitioning problem onto the MIN-CUT problem is as follows", "Since the minimum cut contains edges with the smallest weights [capacities], those edges represent the line of minimum communication between the client and server"); and

f) placing task components on said terminal nodes responsive to said min cut solution (col. 23 lines 13-23, "After all data has been gathered, it is the optimization algorithm that decides where application units will be placed on the network", wherein the optimization algorithm is a minimum cut algorithm and finds the paths of minimal communication costs).

Ibe teaches the invention as claimed, including the following limitations not shown by Hunt, specifically:

b) assigning terminal nodes to said communication graph (col. 5 line 64 - col. 6 line 3, "Shaded nodes 3, 6, and 10 are anchor nodes", wherein an anchor node is analogous to the claimed terminal nodes in both form and function); and

c) identifying nodes adjacent to terminal nodes and connected to each adjacent terminal node by a terminal edge (col. 9 line 66 - col. 10 line 15, "Graph adjacency information may be constructed in the form of an adjacency matrix such that id node i and node j are adjacent, the entry in row i, column j is 1; otherwise, it is zero"); and

d) reducing the weight of each terminal edge for each said identified node by the minimum weight of every terminal edge for said identified node (col. 24 lines 43-58, "If a cluster's weight is larger than the maximum allowed weight [W>L+t], a neighboring cluster having the smallest weight without a weak link interconnecting them is found. A node which is adjacent to the smaller cluster is moved to the smaller weight cluster").

It would have been obvious to one of ordinary skill in the art to combine Hunt with Ibe since in cases where a particular task is large, the time required to generate a minimum cost cut of the graph may prove to be prohibitively high. Thus, to modify Hunt with Ibe would have been obvious in order to calculate minimum costs for smaller graphs, while maintaining data dependencies between the sub-graphs, such that all communication links are still intact.

As per claim 2, Ibe teaches the invention as claimed, including a task management method as in claim 1, after the step (b) of assigning terminal nodes, further comprising the steps of:

b1) identifying independent nets in said communication graph, each of said independent nets being connected between a plurality of said terminal nodes (col. 8 line 31 - col. 9 line 24, "One embodiment of a method of automatically partitioning a graph may generally be described with reference to Fig. 3A, the individual steps being discussed in greater detail below. In this embodiment, the presence of anchor nodes makes it unnecessary to construct clusters in an arbitrary manner").

As per claim 3, Ibe teaches the invention as claimed, including a task management method as in claim 2, wherein the step (c) of identifying nodes comprises the steps of:

i) identifying nodes that are adjacent to each of said plurality of terminal nodes (col. 9 line 66 - col. 10 line 15, "Graph adjacency information may be constructed in the form of an adjacency matrix such that id node i and node j are adjacent, the entry in row i, column j is 1; otherwise, it is zero");

ii) selecting nodes from said identified nodes, terminal edges connected to said selected nodes having a weight greater than zero (col. 9 line 66 - col. 10 line 15, "In the table, the zero-valued entries [representing non-adjacent nodes] have been left blank", wherein if the weight is non-zero, it is listed in the adjacency matrix);

iii) identifying the minimum terminal edge weight for each said selected node (col. 9 line 66 - col. 10 line 15, "Adjacent nodes with weak edges interconnecting them have entries labeled 'W' to indicate that, as much as possible, the two nodes should be in different domains"); and

iv) reducing weights of all terminal edges of each selected node by its corresponding identified minimum (col. 24 lines 43-58, "If a cluster's weight is larger than the maximum allowed weight [W>L+t], a neighboring cluster having the smallest weight without a weak link interconnecting them is found. A node which is adjacent to the smaller cluster is moved to the smaller weight cluster", wherein the weight of the edges is reduced by moving a node to another cluster or net).

As per claim 4, Hunt teaches the invention as claimed, including a task management method as in claim 3, wherein each said task component is a unit of the computer program (col. 24 lines 8-28, "Create one node for each unit in the application").

As per claim 5, Hunt teaches the invention as claimed, including a task management method as in claim 4, wherein said each computer program unit is an instance of an object in an object oriented program (col. 1 lines 36-55, "Various types of modular software, including software designed in an object-oriented framework, can conceivably be distributed throughout a distribution system", wherein the placement of task components corresponds to the distribution of objects in an object oriented application).

As per claim 6, Ibe teaches the invention as claimed, including a task management method as in claim 4, wherein in step (d) computer program units are placed on computers, computer program units being placed on a common computer being combined into a single

component (col. 9 line 66 - col. 10 line 15, "if two nodes are required to be in the same cluster, they are 'lumped' into one node and not considered as separate nodes").

As per claim 7, Hunt teaches the invention as claimed, including a task management method as in claim 3, wherein said task is integrated circuit chip functional element placement and said task components are logic elements, said logic elements being placed on an integrated circuit chip in placement step (f) (col. 1 lines 36-55, "Various types of modular software, including software designed in an object-oriented framework, can conceivably be distributed throughout a distribution system", wherein any task that is represented in an object oriented framework that is operable in a distributed processing environment is capable of implementing the task management system taught in the combination of Hunt and Ibe).

As per claim 8, Hunt teaches the invention as claimed, including a distributed processing system for determining optimal placement of computer program components on multiple computers, said distributed processing system comprising:

means for generating a communication graph of nodes interconnected by edges and representative of a computer program (col. 23 lines 13-23, "the application units and inter-unit communication form a commodity flow network", wherein the application units are components of a task or an application program, and the inter-unit communication provides information pertaining to the weighting of edges), computer program components being represented as non-terminal nodes (col. 24 lines 8-28, "Create one node for each unit in the applications") and edges connecting ones of said non-terminal nodes, said edges representing communication between

connected nodes and being weighted proportional to communication between connected nodes (col. 24 lines 8-28, "Create one edge between every pair of communication units. The weight on the edge should be the difference between communication cost [communication time] for the remote case [when two application units are placed on separate machines] and the local case [when the two application units are placed on the same machine]");

means for determining a min cut solution for said communication graph (col. 24 lines 8-28, "the algorithm to map a client-server distributed partitioning problem onto the MIN-CUT problem is as follows", "Since the minimum cut contains edges with the smallest weights [capacities], those edges represent the line of minimum communication between the client and server"); and

means for placing program components on ones of said computers responsive to said determined min cut solution (col. 23 lines 13-23, "After all data has been gathered, it is the optimization algorithm that decides where application units will be placed on the network", wherein the optimization algorithm is a minimum cut algorithm and finds the paths of minimal communication costs);

said computer program being executed by said computers (col. 23 lines 13-23, "After all data has been gathered, it is the optimization algorithm that decides where application units will be placed on the network", wherein the placement of the program components determine on which network machines the program components execute).

Ibe teaches the invention as claimed, including the following limitations not shown by Hunt, specifically computers executing said computer program being represented as terminal

nodes (col. 5 line 64 - col. 6 line 3, "Shaded nodes 3, 6, and 10 are anchor nodes", wherein an anchor node is analogous to the claimed terminal nodes in both form and function);

means for identifying non-terminal nodes connected to terminal nodes (col. 9 line 66 - col. 10 line 15, "Graph adjacency information may be constructed in the form of an adjacency matrix such that id node i and node j are adjacent, the entry in row i, column j is 1; otherwise, it is zero");

means for identifying a minimum terminal edge weight (col. 9 line 66 - col. 10 line 15, "Adjacent nodes with weak edges interconnecting them have entries labeled 'W' to indicate that, as much as possible, the two nodes should be in different domains"); and

means for reducing terminal edge weights responsive to said identified minimum weight (col. 24 lines 43-58, "If a cluster's weight is larger than the maximum allowed weight [W>L+t], a neighboring cluster having the smallest weight without a weak link interconnecting them is found. A node which is adjacent to the smaller cluster is moved to the smaller weight cluster", wherein the weight of the edges is reduced by moving a node to another cluster or net).

As per claim 9, Ibe teaches the invention as claimed, including a distributed processing system as in claim 8, further comprising:

means for identifying independent nets connected between a plurality of said terminal nodes (col. 8 line 31 - col. 9 line 24, "One embodiment of a method of automatically partitioning a graph may generally be described with reference to Fig. 3A, the individual steps being discussed in greater detail below. In this embodiment, the presence of anchor nodes makes it unnecessary to construct clusters in an arbitrary manner").

As per claim 10, Ibe teaches the invention as claimed, including a distributed processing system as in claim 9, wherein said means for identifying non-terminal nodes connected to terminal nodes identifies non-terminal nodes connected to all terminal nodes connected to an independent net (col. 9 line 66 - col. 10 line 15, "Graph adjacency information may be constructed in the form of an adjacency matrix such that id node i and node j are adjacent, the entry in row i, column j is 1; otherwise, it is zero", wherein an adjacency list is built for each supernode or terminal node).

As per claim 11, Hunt teaches the invention as claimed, including a distributed processing system as in claim 10, wherein each said program component is a unit of the computer program (col. 24 lines 8-28, "Create one node for each unit in the application").

As per claim 12, Hunt teaches the invention as claimed, including a distributed processing system as in claim 11, wherein each said program unit is an instance of an object in an object oriented program (col. 1 lines 36-55, "Various types of modular software, including software designed in an object-oriented framework, can conceivably be distributed throughout a distribution system", wherein the placement of task components corresponds to the distribution of objects in an object oriented application).

As per claim 13, Hunt teaches the invention as claimed, including a computer program product for determining optimal placement of functional components, said computer program

product comprising a computer usable medium having computer readable program code thereon, said computer readable program code comprising:

computer readable program code means for generating a communication graph of nodes interconnected by edges and representative of a function (col. 23 lines 13-23, "the application units and inter-unit communication form a commodity flow network", wherein the application units are components of a task or an application program, and the inter-unit communication provides information pertaining to the weighting of edges), functional components being represented as non-terminal nodes (col. 24 lines 8-28, "Create one node for each unit in the applications"), said edges representing communication between connected nodes (col. 24 lines 8-28, "Create one edge between every pair of communication units. The weight on the edge should be the difference between communication cost [communication time] for the remote case [when two application units are placed on separate machines] and the local case [when the two application units are placed on the same machine]");

computer readable program code means for determining a min cut solution for said communication graph (col. 24 lines 8-28, "the algorithm to map a client-server distributed partitioning problem onto the MIN-CUT problem is as follows", "Since the minimum cut contains edges with the smallest weights [capacities], those edges represent the line of minimum communication between the client and server"); and

computer readable program code means for placing program components on said terminal nodes responsive to said determined min cut solution (col. 23 lines 13-23, "After all data has been gathered, it is the optimization algorithm that decides where application units will

be placed on the network", wherein the optimization algorithm is a minimum cut algorithm and finds the paths of minimal communication costs).

Ibe teaches the invention as claimed, including the following limitations not shown by Hunt, specifically said nodes including a plurality of terminal nodes (col. 5 line 64 - col. 6 line 3, "Shaded nodes 3, 6, and 10 are anchor nodes", wherein an anchor node is analogous to the claimed terminal nodes in both form and function);

computer readable program code means for identifying non-terminal nodes connected to terminal nodes (col. 9 line 66 - col. 10 line 15, "Graph adjacency information may be constructed in the form of an adjacency matrix such that id node i and node j are adjacent, the entry in row i, column j is 1; otherwise, it is zero");

computer readable program code means for identifying a minimum terminal edge weight (col. 9 line 66 - col. 10 line 15, "Adjacent nodes with weak edges interconnecting them have entries labeled 'W' to indicate that, as much as possible, the two nodes should be in different domains"); and

computer readable program code means for reducing terminal edge weights responsive to said identified minimum weight (col. 24 lines 43-58, "If a cluster's weight is larger than the maximum allowed weight [W>L+t], a neighboring cluster having the smallest weight without a weak link interconnecting them is found. A node which is adjacent to the smaller cluster is moved to the smaller weight cluster", wherein the weight of the edges is reduced by moving a node to another cluster or net).

As per claim 14, Ibe teaches the invention as claimed, including a computer program product as in claim 13, further comprising:

computer readable program code means for identifying independent nets connected between a plurality of terminal nodes (col. 8 line 31 - col. 9 line 24, "One embodiment of a method of automatically partitioning a graph may generally be described with reference to Fig. 3A, the individual steps being discussed in greater detail below. In this embodiment, the presence of anchor nodes makes it unnecessary to construct clusters in an arbitrary manner").

As per claim 15, Ibe teaches the invention as claimed, including a computer program product as in claim 14, wherein the computer readable program code means for identifying non-terminal nodes connected to terminal nodes identifies non-terminal nodes connected to all terminal nodes connected to an independent net (col. 9 line 66 - col. 10 line 15, "Graph adjacency information may be constructed in the form of an adjacency matrix such that id node i and node j are adjacent, the entry in row i, column j is 1; otherwise, it is zero", wherein an adjacency list is built for each supernode or terminal node).

As per claim 16, Hunt teaches the invention as claimed, including a computer program product as in claim 15, wherein said function is a computer program and each said functional component is a unit of the computer program (col. 24 lines 8-28, "Create one node for each unit in the application").

As per claim 17, Hunt teaches the invention as claimed, including a computer program product as in claim 16, wherein each said program unit is an instance of an object in an object oriented program (col. 1 lines 36-55, "Various types of modular software, including software designed in an object-oriented framework, can conceivably be distributed throughout a distribution system", wherein the placement of task components corresponds to the distribution of objects in an object oriented application).

As per claim 18, Hunt teaches the invention as claimed, including a computer program product as in claim 15, wherein said function is integrated circuit chip functional element placement and each said functional component is a logic element (col. 1 lines 36-55, "Various types of modular software, including software designed in an object-oriented framework, can conceivably be distributed throughout a distribution system", wherein any task that is represented in an object oriented framework that is operable in a distributed processing environment is capable of implementing the task management system taught in the combination of Hunt and Ibe).

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

French et al. (USPN 6,266,053) is directed to transforming a graph by partitioning into sub-graphs.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Syed J Ali whose telephone number is (703) 305-8106. The examiner can normally be reached on Mon-Fri 8-5:30, 2nd Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai T An can be reached on (703) 305-9678. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Syed Ali
March 1, 2004

MENG-AL T. AN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100